40W, AC/DC converter

FEATURES

- Wide 85 - 264V Universal AC or 100 - 370VDC Input voltage
- Operating ambient temperature range: -40℃ to +70℃
- High I/O isolation test voltage of up to 4000VAC
- Regulated output, Low ripple & noise
- Output short circuit, overcurrent, overvoltage protection
- High efficiency, high reliability
- Plastic case meets UL94V-0 flammability
- Meet EMI CISPR32/EN55032 CLASS B
- Designed to meet IEC/EN/UL62368 standards (Approval Pending)

RoHS

LHE40-20Bxx series are 40W efficient environmental-protection AC-DC module power supply.It features universal AC input and at the same time accepts DC input voltage, low power consumption, high efficiency, high reliability, safer isolation. It offers good EMC performance compliant to IEC/EN61000-4 and CISPR32/EN55032 and the safety certifications to UL62368 and EN62368 standards are pending. The converters are widely used in control, electricity, office applications. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

Selection Guide

Part No.*	Output Power	Nominal Output Voltage and Current (Vo1/Io1)	Efficiency at 230VAC (%)Typ.	Capacitive Load (μF)Max.
LHE40-20B03	26.4W	3.3VDC/8000mA	78	60000
LHE40-20B05	40W	5VDC/8000mA	82	40000
LHE40-20B12		12VDC/3330mA	84	9000
LHE40-20B15		15VDC/2660mA	84	7000
LHE40-20B24		24VDC/1670mA	84	2000
LHE40-20B48		48VDC/830mA	84	1000

Note:*Product model with a suffix of "A5" means chassis mounting and that with a suffix of "A6" indicates DIN-Rail mounting (e.g. LHE40-20B03A5 means chassis mounting; LHE40-20B03A6 means DIN-Rail mounting).

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	264	VAC
	DC input	100	--	370	VDC
Input frequency		47	--	63	Hz
Input current	115VAC	--	--	1.0	A
	230VAC	--	--	0.6	
Inrush current	115VAC	--	50	--	
	230VAC	--	70	--	
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	All load range	--	±2	--	%
Line Regulation	Rated load	--	±0.5	--	%
Load Regulation	0% - 100% load(3.3V/5V Output)	--	±1	±3	
	0% - 100% load(12V/15V /24V/48V Output)	--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	80	150	mV
Temperature Coefficient		--	±0.02	--	%/℃
Stand-by Power Consumption		--	--	0.5	W

Short Circuit Protection		Hiccup, continuous, self-recovery			
Overcurrent Protection		≥110%Io self-recovery			
Overvoltage Protection	3.3V Output	--	--	5.5	V
	5V Output	--	--	9	
	12V Output	--	--	16	
	15V Output	--	--	24	
	24V Output	--	--	35	
	48V Output	--	--	56	
Minimum Load		0	--	--	%
Hold-up Time	115VAC input	--	10	--	ms
	230VAC input	--	50	--	

Note: * Ripple and noise are measured by "parallel cable" method, please see AC-DC Converter Application Notes for specific operation.

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output	Electric Strength Test for 1min, leakage current <10mA	4000	--	--	VAC
Operating Temperature			-40	--	+70	℃
Storage Temperature			-40	--	+85	
Storage Humidity			--	--	95	%RH
Soldering Temperature		Wave-soldering	260 ± 5℃; time: 5 - 10s			
		Manual-welding	360 ± 10℃; time: 3 - 5s			
Switching Frequency			--	65	--	kHz
Power Derating		-40℃ to -30℃ (LHE40-20B03/05)	4.0	--	--	%/℃
		-40℃ to -30℃ (LHE40-20B12/15)	3.0	--	--	
		-40℃ to -30℃ (LHE40-20B24/48)	2.0	--	--	
		+45℃ to +70℃ (LHE40-20B03/05)	3.0	--	--	
		+55℃ to +70℃ (LHE40-20B12/15)	3.7	--	--	
		+55℃ to +70℃ (LHE40-20B24/48)	2.7	--	--	
		85VAC-100VAC	1.33	--	--	%/VAC
Safety Standard			IEC62368/EN62368/UL62368			
Safety Certification			IEC62368/EN62368/UL62368			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25℃ > 300,000 h			

Case Material

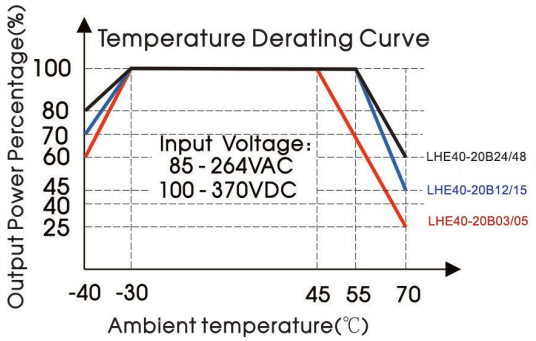
Casing Material		Black flame-retardant and heat-resistant plastic (UL94V-0)
Dimensions	Horizontal package	89.00 x 63.50 x 25.00 mm
	A5 chassis package	135.00 x 70.00 x 33.50 mm
	A6 DIN-rail package	137.00 x 70.00 x 39.00 mm
Weight	Horizontal package/A5 chassis package/A6 DIN-rail package	215g/300g/360g(Typ.)
Cooling Method		Free air convection

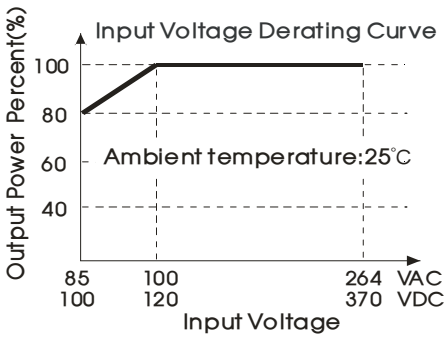
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B	
	RE	CISPR32/EN55032	CLASS B	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV	perf. Criteria B
		IEC/EN61000-4-4	±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±1KV	perf. Criteria B
		IEC/EN61000-4-5	line to line±2KV/ line to ground ±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B

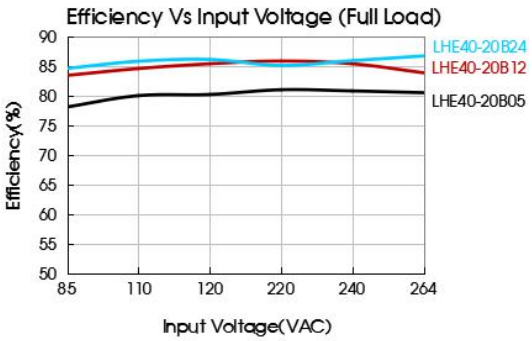
	CS	IEC/EN61000-4-6 10Vr.m.s	perf. Criteria A

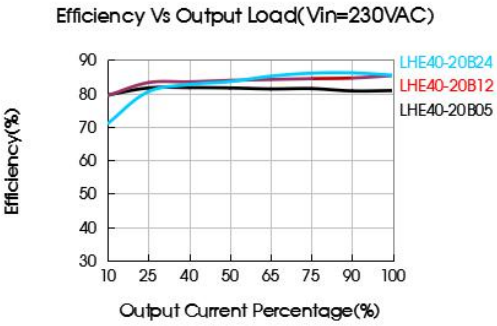
Product Characteristic Curve





Note: ① With an AC input between 85-100VAC and a DC input between 100-120VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.





Design Reference

1. Typical application circuit

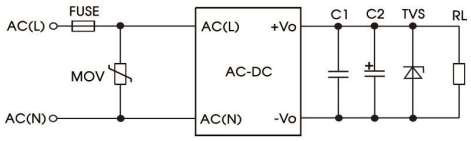


Fig. 1: LHE40-20Bxx typical application circuit

型号	C2(uF)	C1 (uF)	TVS
LHE40-20B03	680	1	SMBJ7.0A
LHE40-20B05	680	1	SMBJ7.0A
LHE40-20B12	220	1	SMBJ20A
LHE40-20B15	220	1	SMBJ20A
LHE40-20B24	120	1	SMBJ30A
LHE40-20B48	100	1	SMBJ64A

Note: We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2 (refer to manufacture's datasheet). Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor used for filtering high-frequency noise and TVS is a recommended suppressor diode to protect the application in case of a converter failure.

2. EMC solution-recommended circuit

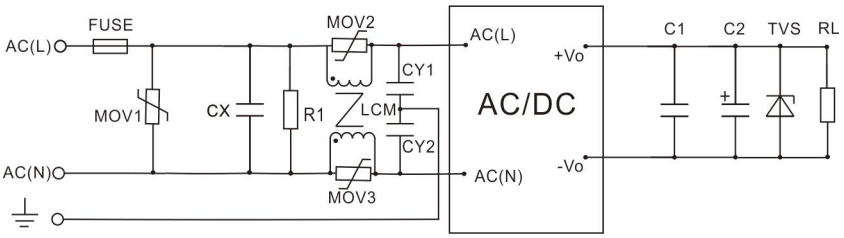
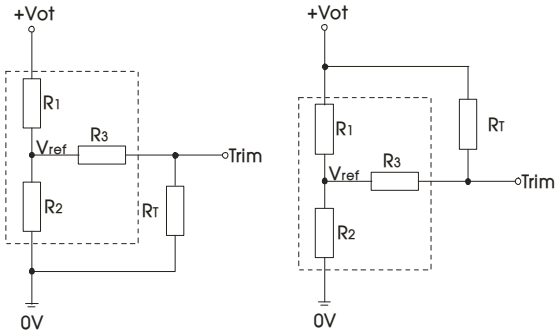


Fig.2 (Output external circuit refer to the typical application circuit)

Element model	Recommended value
MOV1	S14K350
MOV2, MOV3	S07K350
CX	0.15μF/300VAC
CY1	2.2nF/400VAC
CY2	2.2nF /400VAC
R1	1MΩ/2W
LCM	2.2 mH, recommended to use MORNSUN's FL2D-10-222
FUSE	3.15A/250V slow fusing, required

3. Application of Trim and calculation of Trim resistance



Applied circuits of Trim (Part in broken line is the interior of models)

Calculation formula of Trim resistance:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{Vref}{Vot - Vref} \cdot R_1$$

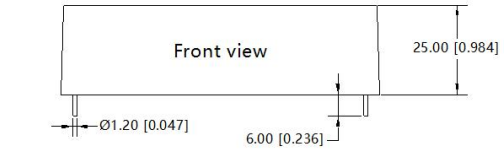
$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vot - Vref}{Vref} \cdot R_2$$

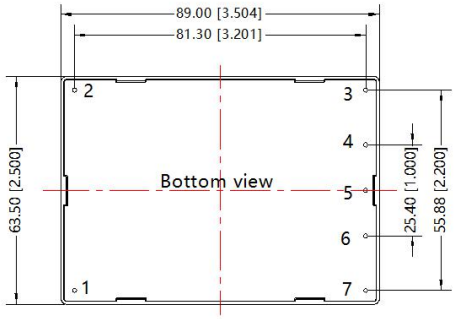
R_T is Trim resistance, a is a self-defined parameter, with no real meaning.

Vout	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)	Vot(V)
3.3V	2	1.2	1	1.24	Output voltage after regulation, variation ≤ ±10%
5V	3.3	3.3	1	2.5	
12V	3.83	1	1	2.5	
15V	7.5	1.5	1	2.5	
24V	8.66	1	1	2.5	
48V	22	1.2	1	2.5	

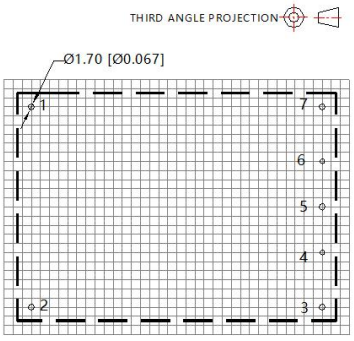
4. For additional information please refer to application notes on www.mornsun-power.com

Dimensions and Recommended Layout





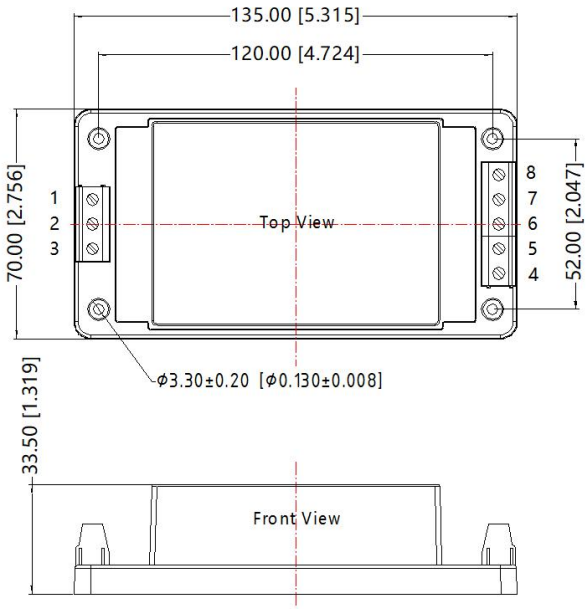
Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]



Note : Grid 2.54*2.54mm

Pin-Out	
Pin	LHE40-20B
1	AC(L)
2	AC(N)
3	Trim
4	No Pin
5	-Vo
6	No Pin
7	+Vo

A5 Chassis Package Dimensions

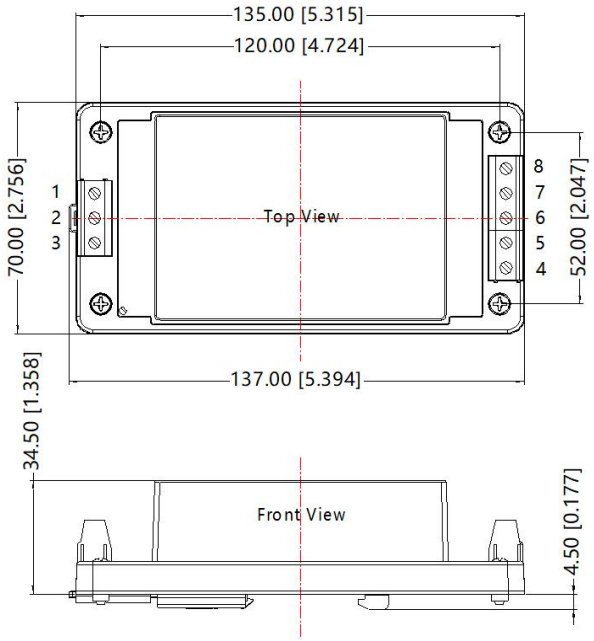


Pin-Out	
Pin	LHE40-20B
1	AC(L)
2	AC(N)
3	NC
4	Trim
5	NC
6	-Vo
7	NC
8	+Vo

Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.040]

A6 DIN-rail Package Dimensions

THIRD ANGLE PROJECTION



Pin-Out	
Pin	LHE40-20B
1	AC(L)
2	AC(N)
3	NC
4	Trim
5	NC
6	-Vo
7	NC
8	+Vo

Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
Mounting rail: TS35, rail needs to connect safety ground
General tolerances: ±1.00[±0.040]

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packing bag number of Horizontal package: 58220021, the Packing bag number of A5/A6 package: 58220031;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our Company's corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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